Use of Prescribed Fire in Resource Management & Fire Effects on Vegetation

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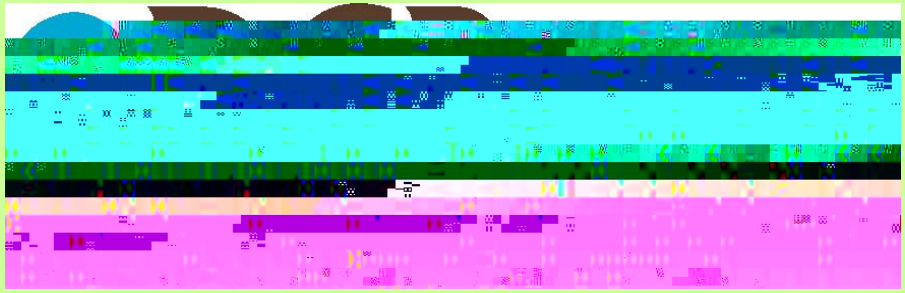


Common Uses of Prescribed Fire

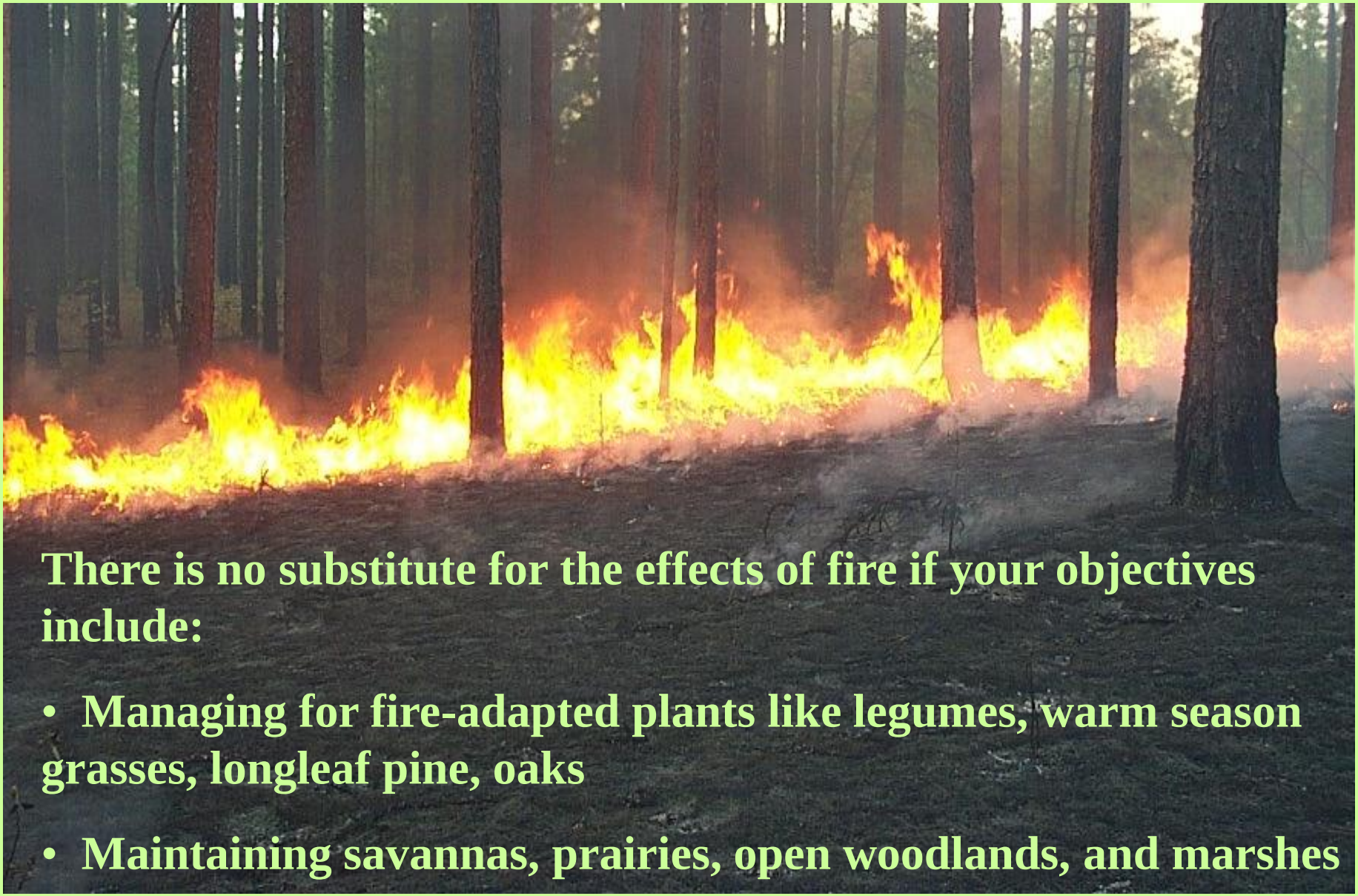
- Maintain fields in early successional stages
- Improve foraging habitat for deer & other species
- Maintain warm season grasses
- Maintain marsh food sources for waterfowl
- Prepare harvested sites for tree planting
- Reduce hardwood competition to planted pines
- Restore/maintain natural and historic vegetation

Prescribed fire has become more difficult to use

- Urban interface expansion
- More & busier roads
- Increased liability costs
- Air quality laws
- Local burning restrictions
- Public mis-perceptions

So…Why Burn?

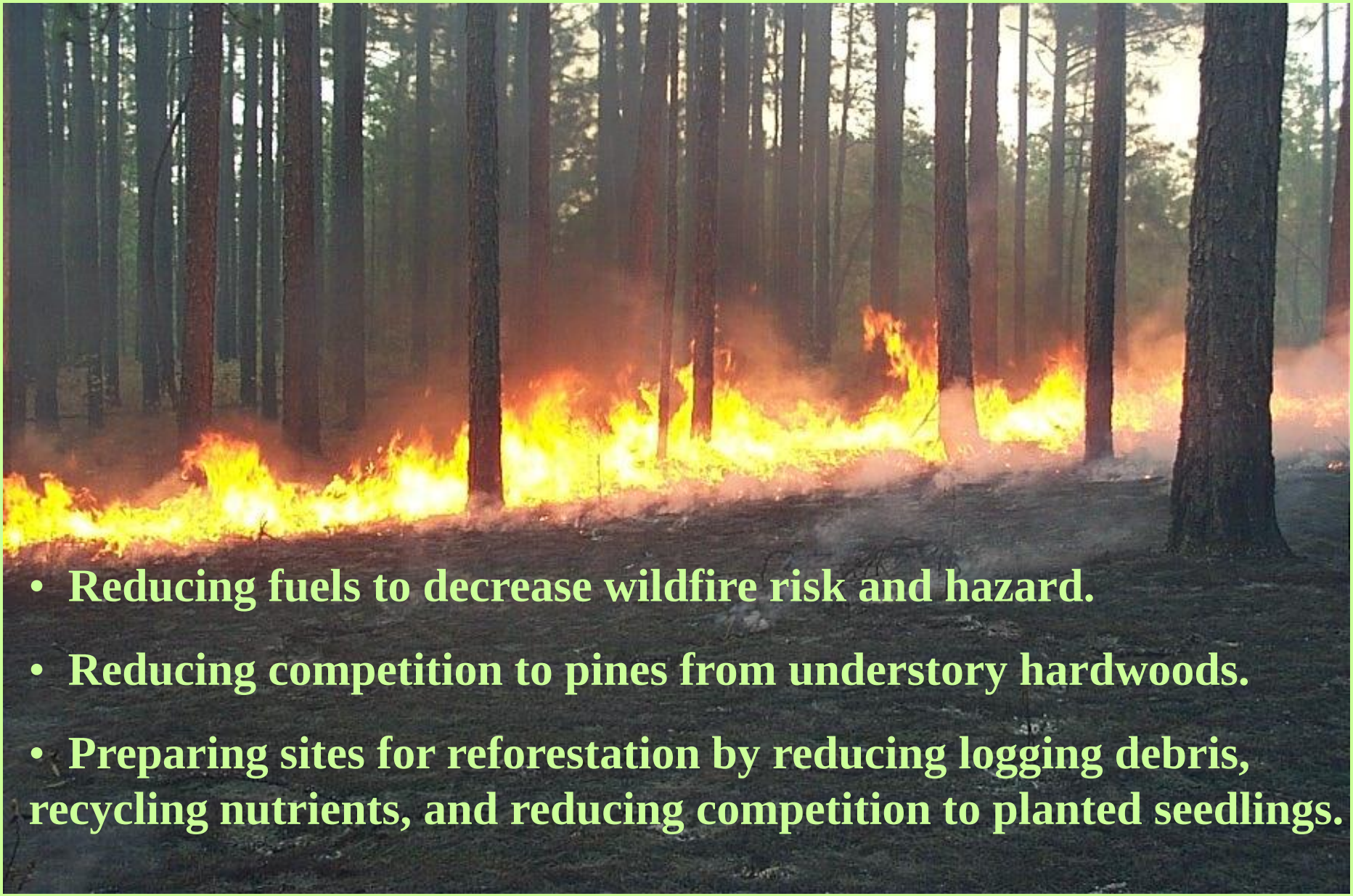
Why not just bush-hog, disk, or use herbicides to manipulate vegetation or set back succession?



There is no substitute for the effects of fire if your objectives include:

- **Managing for fire-adapted plants like legumes, warm season grasses, longleaf pine, oaks**
- **Maintaining savannas, prairies, open woodlands, and marshes**

- **Managing to benefit animals that require fire-maintained habitats: bobwhite quail, wild turkeys, red-cockaded woodpeckers, fox squirrels, and Bachman's sparrows**



- **Reducing fuels to decrease wildfire risk and hazard.**
- **Reducing competition to pines from understory hardwoods.**
- **Preparing sites for reforestation by reducing logging debris, recycling nutrients, and reducing competition to planted seedlings.**

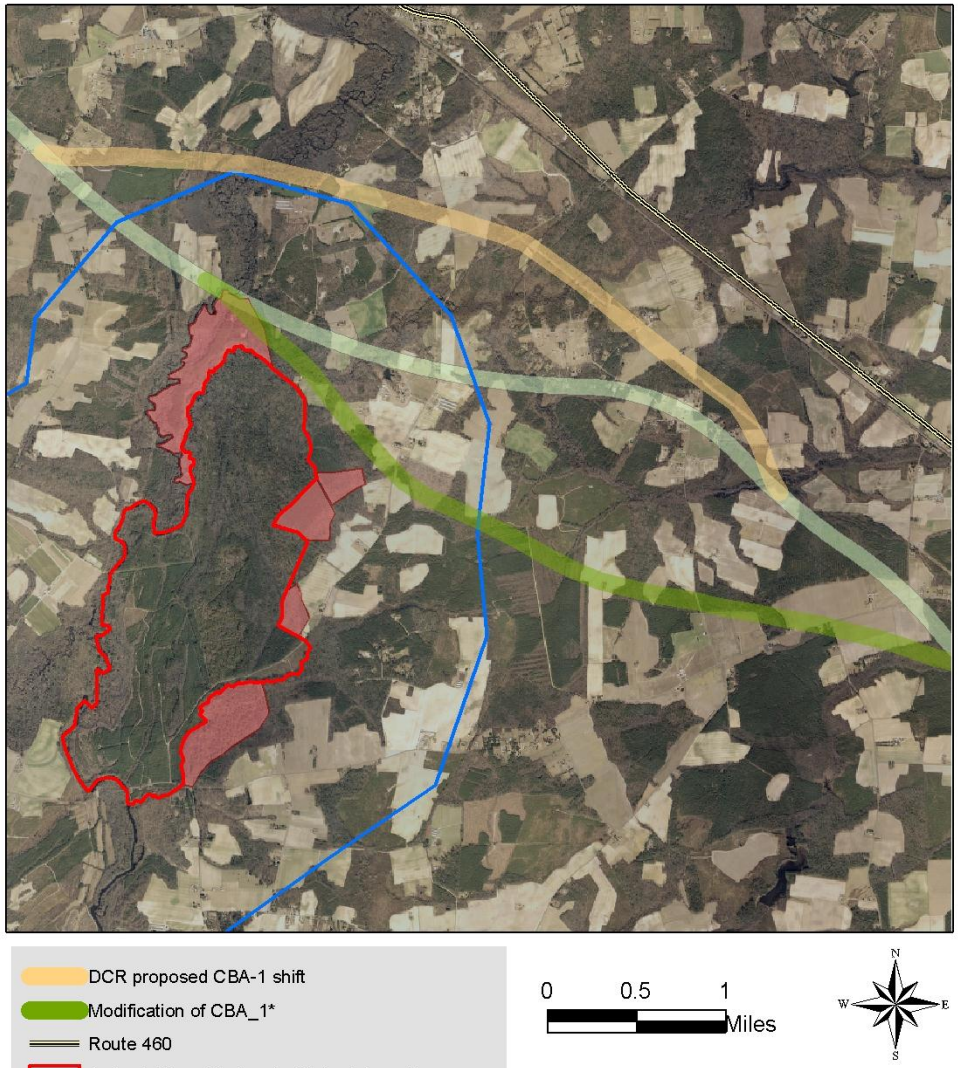
Benefits provided by fire:

- **Increased flowering and more seed** following burning
- **Increased germination rates** from heat scarification (legumes)
- **Increased seedling recruitment due to thinner forest floor** gives (1) ready access to mineral soil by roots of germinating seeds; (2) lower numbers of seed predators
- **Increased nutrients** become available following burning, improving plant growth
- **Reduced soil compaction** from increased biological activity, absence of equipment passage.

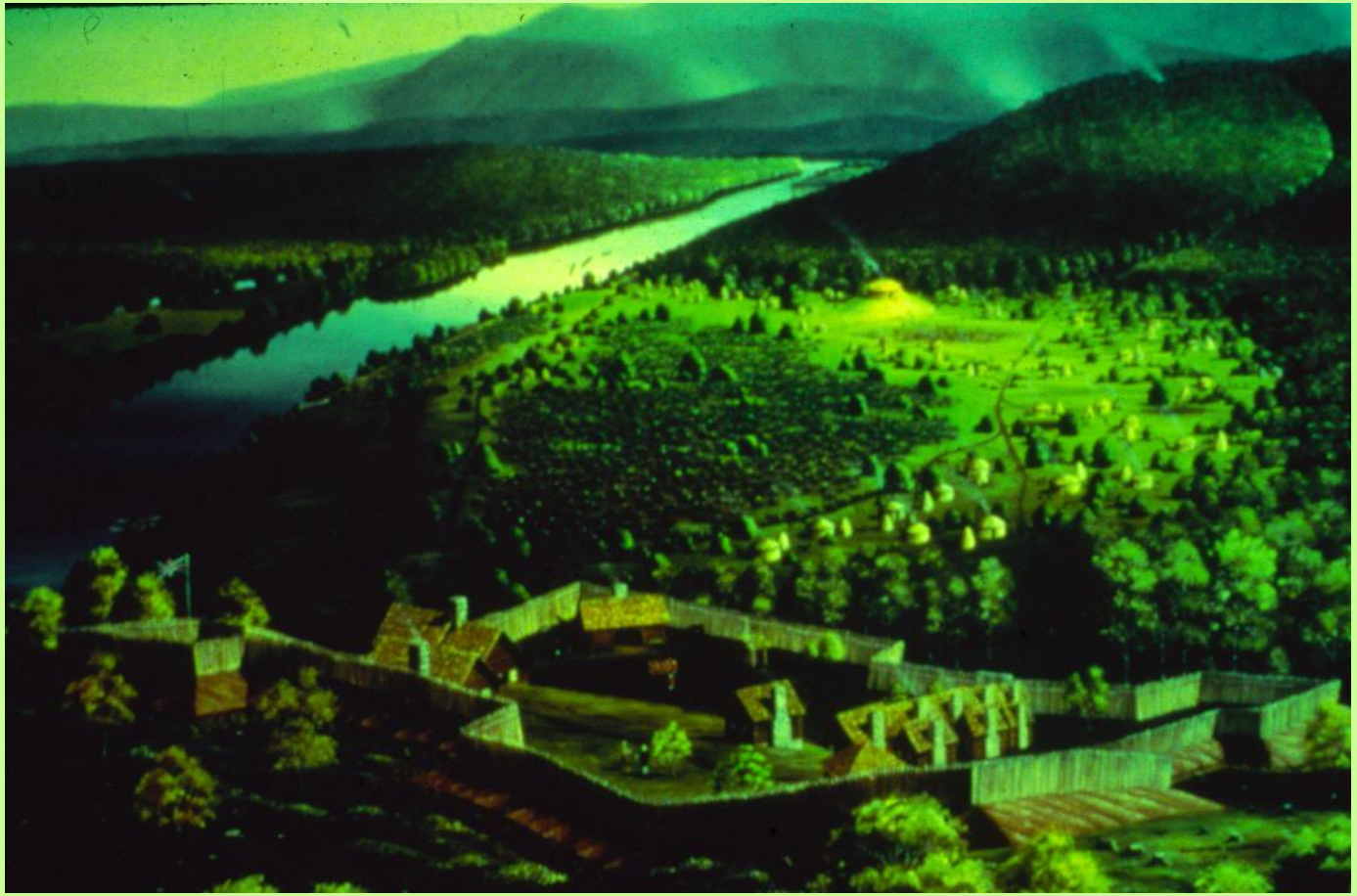
Why Burn?
Consider alternative practice costs

- Prescribed burning ($30 - $115/acre)
- vs.
- Mowing/bush-hogging ($60 - $150/acre)
- Herbicide treatments ($75 - $250/acre)
- Drum chopping ($125 - $275/acre)
- Disking ($100 - $200/acre?)

But don’t kid yourself…it IS getting harder to burn!



Fire History
w/ Shep Zedaker



Talking About Fire:
Six Terms for Describing Fire

- Season of burn
- Frequency
- Intensity
- Severity
- Type
- Pattern

Season of Burn

October - March

Dormant season fire

("winter burning" or "cool season fire")

vs.

Growing season fire

("summer burning" or "warm season fire" or "lightning season fire"

April - September

Frequency of Burn

Frequent: 1-10 year fire return intervals

- woody plants stay relatively small
- herbaceous plant abundance & diversity increase
- fuel loads remain light
- forest floor stays thin
- seed predator populations remain low

Frequency of Burn

Infrequent: 10-50 year fire return intervals

- woody plants become large; forest understory becomes dense
- herbaceous plant abundance and species diversity is low
- fuel loads become heavy
- forest floor becomes thick
- seed predator populations become high

Fire Intensity and Severity

Intensity: The amount of heat energy released

Severity: The extent of forest floor consumed and mineral soil exposed

Low intensity fire

Moderate intensity fire

High intensity fire

Low severity burn

High severity burn

Factors affecting fire intensity & severity

- Fuel load (amount)
- Fuel type (fine/coarse; dead/live)
- Fire type (surface/crown)
- Fuel moisture
- Residence time
- Litter/duff moisture
- Weather on day of burn (RH/windspeed/air temp…)

Fire Pattern = “patchiness”

Fire Type

Surface fire

Ground fire

Crown fire

Components of a Fire Regime

- Fire type (surface; crown; ground)
- Season of burn (dormant; growing)
- Fire frequency (how often)
- Fire intensity (how much heat energy produced)
- Fire severity (how much mineral soil exposed)
- Fire pattern (patchiness)

Use a combination of these to write a **Prescribed Fire Plan** to achieve a specific management objective.

Fire Effects on Vegetation

Fire-dependant plants of Virginia

Some animals depend on fire-maintained habitats

Pitcherplant moths

Bobwhite quail

Pitcherplants

Open pine woodlands

Fire-maintained natural communities

Pine savannas

Piedmont prairies & woodlands

Fire-maintained natural communities

Pocosins and Atlantic white-cedar forests

Red-cedar glades

Dormant season prescribed fire

- October through March
- Mimics “Indian burning” (times of year when lightning ignitions are rare)
- For the most part, plants are not physiologically active
- Reduces fuel loads
- Reduces size of woody plants but often not their abundance

Dormant Season Fire Effects on Vegetation

- Encourages hardwoods to re-sprout for regeneration & browse
- Promotes soft mast production (blueberries, etc.)
- Minimizes herbaceous re-growth
- Avoids crown scorch if burning in pine stands
- Preferred for reducing competition in longleaf seedling stands

Growing season prescribed fire

- April through September
- Mimics lightning-ignited wildfire
- Lethal temperature (140 degrees F) is more easily reached due to warm air/plant tissue temperatures.
- **Repeated** GS fires reduce the abundance of woody plants by causing plant mortality (not just top-kill)
- GS fires followed by summer drought increases mortality to woody plants

Growing Season Fire Effects on Vegetation

Increases herbaceous plant flowering & seed production

Reduces abundance of woody plants

Leads to “open” forest stand structure

Key points: Season of burn

Dormant season burns:

- Are typically cooler
- They reduce size of trees/shrubs but result in greater numbers of woody stems due to multiple re-sprouts.

Growing season burns

- Are typically hotter
- Can reduce the number of woody stems – repeated burns
- Increases herbaceous plant flowering and seed production.

Useful reference on seasonal burning effects:

Robbins, L.E. and R.L. Myers. 1992. Seasonal effects of prescribed burning in Florida: A review. The Nature Conservancy Fire Management and Research Program. Tallahassee, Florida.

Remember:
Season of burn is just one of many factors determining how fires affect vegetation

Other key factors include:

- Fire intensity
- Fire frequency
- Weather and fuel conditions

Useful References on Fire History and Fire Effects on Vegetation

- Van Lear, D.H. and T.A. Waldrop. 1989. History, uses, and effects of fire in the Appalachians. USDA Forest Service General Technical Report SE-54. Asheville, NC.
- Brown, H. 2000. Wildland burning by American Indians in Virginia. Fire Management Today, Vol. 60, No. 3.
- Barden, L.S. 1997. Historic prairies in the Piedmont of North and South Carolina, USA. Natural Areas Journal, Vol. 17, No. 2.

Some Uses of Prescribed Fire in Natural Resource Management

Fire is a key component of longleaf pine silviculture

- Shelterwood cutting & fire are needed to naturally regenerate longleaf pine
- Burning creates thin/patchy litter, mineral soil seedbeds
- Fire reduces competition from adjacent vegetation
- Fire controls brown-spot needle disease
- Increases nutrient availability, promoting root development and early bolting from grass stage

Longleaf pine regeneration

- Longleaf seed requires mineral soil contact for germination and establishment
- Fire creates favorable conditions for seedlings to become established and keeps competition low for grass stage seedlings

Fire won’t kill most grass stage longleaf pines

Four months later

Just after a February burn

Fire controls competing adjacent vegetation in longleaf seedling stands

Fire and longleaf pine seedlings

Fire controls brown spot needle disease of longleaf seedlings

Longleaf pine seedlings make rapid height growth in full sunlight and with adequate competition and disease control from burning

Fire in oak silviculture: the shelterwood-burn technique

- Role of fire in maintaining oak forests now established
- Fire favors oaks in mixed species regeneration stands
- Oak regeneration is more resistant to surface fires than its primary competitors
- Cutting followed by fire mimics natural disturbance sequence (ice/wind + fire)

Fire in oak silviculture: the shelterwood-burn technique

- Use high intensity, early growing season fires, 3-5 years following a partial overstory harvest
- There must be existing oak regeneration in the stand (overtopped is OK)
- Spring fires (late April- early May) give best results due to combination of weather (low RH) and condition of vegetation (growth is well along)
- Oaks have larger rootstocks and make more rapid height growth than other species following top-kill from fire

Fire and oak regeneration

Fire gives oaks a height growth advantage over competing species (yellow-poplar, sweetgum, loblolly pine)

After fire, low stem anchorage increases survival and stem quality

Site preparation burning

- Reduces woody fuels
- Creates more planting sites making planting easier
- Controls competition
- Releases nutrients “tied up” in biomass
- Reduces risk of wildfire to young seedlings stands

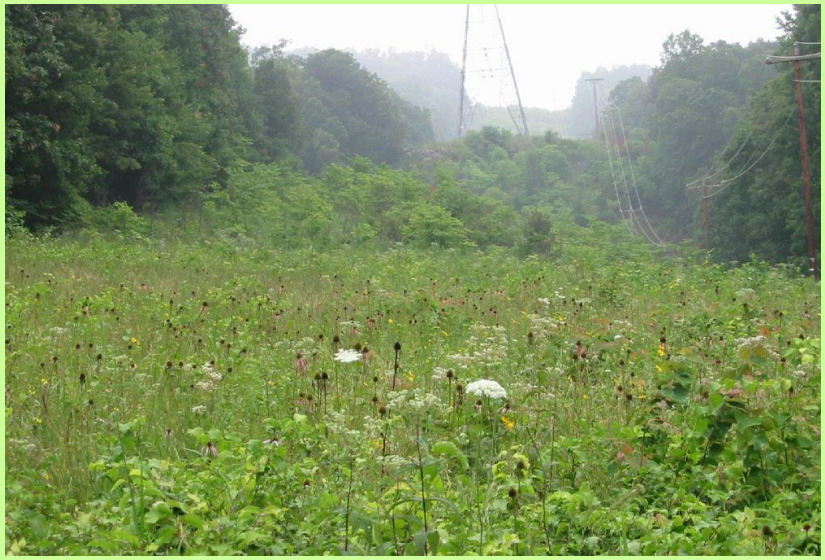
Early growing season fires to restore and maintain native grasslands

- Early growing season (spring) burns most effective
- Removes accumulated herbaceous thatch, improving NWSG germination / establishment
- Reduces fescue leaf area / early growth advantage of cool season grasses
- Recycles nutrients in biomass
- Stimulates seed production and germination
- Reduces woody plant competition
- Increased insect abundance benefits young quail & other birds

Fire for managing marshes

- Reduces woody plant competition, halts succession to wet-site shrubs and trees
- Promotes flowering & seed production of wetland herbs, increases species richness
- Increases germination & recruitment of waterfowl food species (wild rice, duck potato, etc.)
- Can help with reducing Phragmites invasions, if used carefully

Fire in rights-of-way management



- Burning ROWs is a recognized tool in wildlife management.
- ROW habitats often support NWSG & rare plant populations maintained by mowing in the absence of fire.
- Burning the areas adjacent to a ROW allows plants to spread.
- Be aware of safety concerns (arcing / “flash-over” hazard).
- Liability concerns (wooden utility poles)

Fire combined with thinning in upland pine forests improves wildlife habitat

Fire in rare species management

Smooth coneflower (*Echinacea laevigata*)

Summary

Prescribed fire is one of the most important and useful tools available to natural resource managers.

Fire achieves unique results that other methods cannot.

Retaining the use of prescribed fire is a necessary challenge.